

REMARKS

This application has been carefully reviewed in light of the Office Action dated January 9, 2003. Claims 1-3 and 5-7 remain pending in this application. Claims 1 and 6 are the independent claims. Favorable reconsideration is respectfully requested.

On the merits, the Office Action rejected Claims 1-2 and 5 under 35 U.S.C. § 103(a) as being unpatentable over Hawker et al. (U.S. Patent No. 6,413,587; hereinafter "Hawker"). The Office Action also rejected Claim 3 under 35 U.S.C. § 103(a) as being unpatentable over Hawker in view of Maracas et al. (U.S. Patent No. 5,937,758; hereinafter "Maracas"). The Office Action also rejected Claim 6 under 35 U.S.C. § 103(a) as being unpatentable over Whitesides et al. (U.S. Patent No. 5,900,160; hereinafter "Whitesides") in view of Biebuyck et al. (U.S. Patent No. 5,935,359; hereinafter "Biebuyck"). The Office Action also rejected Claim 7 under 35 U.S.C. § 103(a) as being unpatentable over Whitesidesides in view of Whitesides et al. (Article Soft Lithography Agnew. Chem. Int. Ed. 1998, v. 37, patges 551-575; hereinafter "Whitesides-Article"). Applicant respectfully submits that the pending claims are patentable for at least the following reasons.

Applicant's Claim 6 recites: "[a] A method of manufacturing a stamp (10) for use in a lithographic process, which stamp (10, 110)

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has a stamp body (5, 105) with a surface (4, 104) which coincides partly with the printing face (3, 103), comprising the steps of:

anisotropic etching of a surface (27) of a mold (20) into a patterned mold surface (29), such that a first recess (21) and a second recess (23) are created in the mold (20) with apertures in the original surface (27), which first recess (21) and a second recess (23) become narrower as its distance to the original surface (27) increases and has cross-sections parallel to the original surface (27) which, when projected perpendicularly on the original surface (27), lie within the aperture (41), and wherein the first and second recesses have different apertures, and

making a replica of the patterned mold surface (29) in a first body (105) with a patterned surface (104), wherein the replica contains structures of different sizes."

Whitesides fails to recite or suggest first and second recesses have different apertures. Rather, Whitesides only depicts and recites recesses with common apertures. As stated in the Office Action, Whitesides does not expressly disclose different apertures.

In Fig. 3 of Whitesides, a stamp is shown with structures with oblique/slant side faces. However, it is not indicated why or how such a stamp is made. The structures would reach each other, if it were drawn with rectangular structures. A stamp with rectangular

structures results in a contact face somewhat larger than the surface of the structure. Besides, the situation of Whitesides of the stamp during printing is exactly contrary to that of Applicant's invention. The structures in Fig. 3C of Whitesides depicts recesses 24 extending outwards instead of inwards. It is thus very instable for small structures.

In Fig. 9 of Whitesides, a stamp is made of an anisotropically-etched structure. Because the far ends of the stamp contain sharp edges, the contact face is extremely dependent on the pressure. Stamps as shown in Fig. 9, are not useful for printing. Furthermore, through holes in the master of Fig. 9 appear as etched up to in the tips. This implies that a well-defined stamping surface only results through a single replication step, if all through-holes have the same width. This means that stamping will be successful only if the pattern over the complete surface is made up of pixels of the same size (otherwise the pyramids are of different height). Thus Whitesides recites a single replication technique which includes an additional limitation where the contact face of the final stamp cannot then be a print of the planar "upper side" of the original master. Hence, Whitesides fails to recite or suggest structures of different sizes can be printed. Consequently, Claim 6 is believed patentable over Whitesides for at least these reasons.

Applicant's Claim 1 recites, in pertinent part: "a third recess (13) with an aperture (17) in the printing face (3) is present in the stamp body (5),

which recess (13) has cross-sections parallel to the printing face (3) and becomes substantially narrower as its distance to the printing face (30) increases, said cross-sections, when projected perpendicularly on the printing face (3), lying within the aperture (17),

the aperture (17) of the third recess (13) and the aperture (15) of the first recess (11) each have a dimension in a first direction in the printing face (3), and

said dimension of the aperture (17) of the third recess (13) is at least five times the dimension of said aperture (15) of the first recess (11)."

Hawker fails to recite or suggest a third recess with an aperture that is at least five times the dimension of aperture of the first recess. Rather, Hawker only shows recesses of the same aperture. One of ordinary skill in the art would fail to include recesses of multiple apertures because the size of the apertures is not merely convenient for printing face sizes of other dimensions for pattern features of other dimensions. Hawker fails to recite or suggest the third recess having such a large apertures for the prevention of bending of an isolated recess. Consequently, Claim 1 is believed patentable over Hawker or Hawker in view of Hawker.

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Additionally, the Office Action's arguments for obviousness are not correct. Applicant's arguments are in reference to the Embodiment of Hawker, as modified by the patent of Singvi (US5,776,748), which is mentioned by Hawker (see column 7, line 33). In column 13, lines 26-39, Hawker discusses the manufacture of the PDMS stamp. Hawker recites the elastomeric stamp formed by pouring a mixture of PDMS prepolymer and its curing agent onto a clean polystyrene Petri dish. It is left for some time, and then the master is removed. Singvi defines a master as (example 1, column 22): "a mold according to the present invention was fabricated. A template consisting of an exposed and developed photoresist pattern is prepared (This type of fabrication is described in any conventional photolithography text). Templates such as electron microscopy grids or other corrugated materials may also be used. The template is placed in a container such as a petri dish. Singvi continues to say that a mixture of PDMS and Curing agent was poured into the petri dish, and that the PDMS was subsequently cures. Finally the PDMS stamp was carefully peeled from the template.

Clearly, Hawker envisions a photoresist being patterned, and in conventional manner. Thus, a patterned layer results. Evidently, two things can be concluded from the resulting structure:

- (1) The angle between side faces and surface may be a bit larger than 90 degrees, but generally not very different.
 - (2) The photoresist layer has the same thickness everywhere.
- Thus, the stamp of the invention is simply not made and one of ordinary skill in the art at the time of the invention would fail to recognize the advantages of different sized recesses.

Further, the stamp of Hawker does not have the features of the invention. Regarding Fig. 3 of Hawker, in the regions between the desired brush sections, the height is still 10-15 nm, i.e. nearly half of the height of the brush sections. This Fig. 3 is the result of a process according to Claim 2 of Hawker, that shows ideal patterning. The observation in column 14, lines 21-23 of Hawker recites: "no extraneous or unwanted polymer is seen in areas that were not stamped with an initiation site" tends to have a different meaning in the light of this Fig. 3 than in isolation; i.e. he more or less says that the deposit outside the brush sections is minimal or not problematic. The salient point is that Hawker possesses the identical problem as the prior art stamp, i.e., bending of the recessed part of the stamp surface and thus undesired pattern. Thus, Hawker fails to suggest all the advantages of Claim 1.

Further, regarding the schematic figures of Hawker, the ink layer 16 (a solution of an organic compound in ethanol) is present on the complete surface. This implies that the ethanol diffuses

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into the stamp. Hence the recessed parts 14 get heavy and may bend through, particularly if the stamp is used more often.

Further, Hawker recites on column 14, lines 40-50 that the inking of the stamp includes the evaporation of excess solvent. Then the stamp is placed by hand on the substrate. Such a process is however typical for a research laboratory. There is no reason or support that this will function in industrial practice.

The argument of the Office Action that "the stamp disclosed by Hawker et al is for real world applications, it would obviously be usable to pattern features of different sizes" is overly simplistic. The problem with conventional stamps is not in the stamp features. It is in the areas that should not get in contact with a substrate surface. Particularly if these areas between stamp features are large, and if ink is present at the complete surface of the stamp, the chance of bending through (and thus of contact where it is not desired) is very large. Thus, Applicant's Claim 1 is believed patentable over Hawker for at least these reasons.

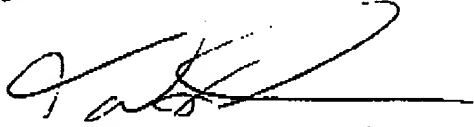
Claims 2-3, 5, and 7 depend from one or another of the independent claims discussed above and are believed patentable for at least the same reasons. In addition, Applicant respectfully believes Claims 2-3, 5, and 7 to be independently patentable and request separate consideration of each claim. Applicant further

believes the § 103 rejections of Claims 3 and 7 to be moot in light of the above remarks and requests their withdrawal.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned agent may be reached by telephone at the number given below.

Respectfully submitted,


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